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Desert Explorations - A Videodisc Exhibit Designed for Flexibility

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Desert Explorations—A Videodisc Exhibit Designed for Flexibility

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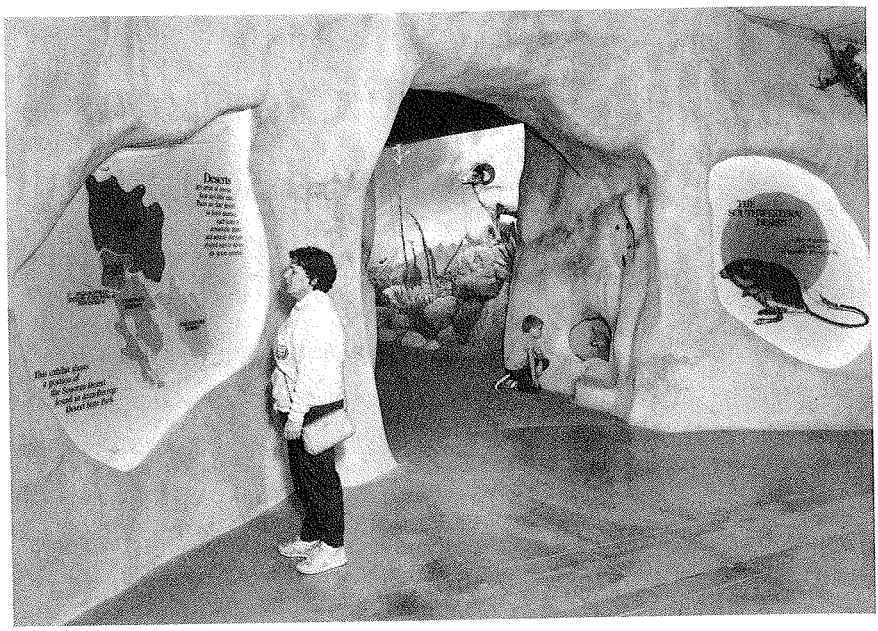
Using an interactive exhibit does not provide the same experience for everyone. How visitors understand an exhibit, what associations it evokes, and even how it is physically utilized may differ widely. This article describes an exhibit that was designed to let visitors tailor their explorations to their own interests and motivation.

The exhibit, called Desert Explorations, gives visitors choices of what to see and how to learn about what they see. This exhibit also is an example of a way of developing interactive videodisc exhibits that is relatively inexpensive yet may be tailored to a particular topic or hall. This technique adapts a commercially available videodisc by using a computer to add text, sounds, graphics, and the interface for exploring the images and information.

THE CHAPMAN GRANT HALL OF DESERT ECOLOGY

The hall opened at the San Diego Natural History Museum during the spring of 1988. Its central theme is the relationships among organisms in the southwestern deserts and their adaptations to the environment. The implicit lesson is that deserts are not barren, desolate wastelands but, rather, places of immense variety, beauty, and value.

The hall features a walk-through desert environment with a sand floor and wind-cut rock archways. A 120-foot diorama re-creates the desert communities of the Anza-Borrego Desert State Park at



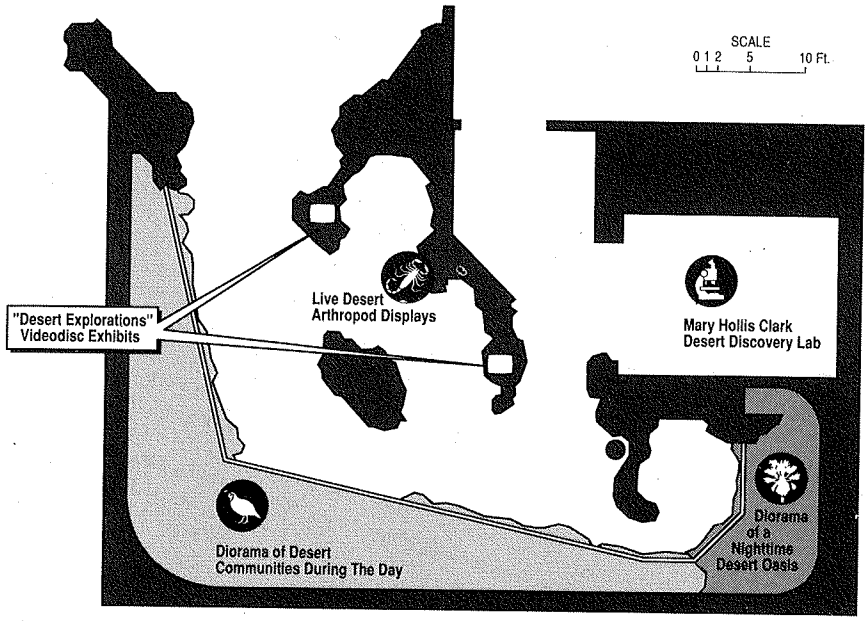
Wind-cut rock archway entrance to the Chapman Grant Hall of Desert Ecology. A desert bighorn sheep in the diorama is visible from the entrance. As they enter the hall, visitors view the inside of a coyote den with a mother and pups. (Photograph by Bill Evarts.)

different times of day and night. Live animals are featured in eight displays of desert arthropods, including two where visitors can activate ultraviolet lights to see scorpions fluoresce green in the dark. The Mary Hollis Clark Desert Discovery Lab invites visitors into a desert naturalist demonstration center. In this room, visitors are encouraged to handle live animals, investigate specimens, and use microscopes in volunteer-led activities on desert biology. At the center of the hall are two videodisc exhibits, Desert Explorations.

DESERT EXPLORATIONS—FLEXIBLE LEARNING TOOLS

These exhibits are the main interpretive device for the hall, since there are few graphics elsewhere. They give visitors choices in how they explore color photographs, sounds, and natural history text on nearly a hundred different organisms, many of which are portrayed in other parts of the hall.

Each exhibit displays color photographs from a videodisc overlaid with computer-generated explanatory text, digitized sound, and "control buttons" that indicate touch-sensitive areas on the screen. Each has two monitors that display the same images. The lower monitors are equipped with infrared touch screens that enable visitors to control the exhibit, while the larger upper monitors are



Floor plan of the Chapman Grant Hall of Desert Ecology. (Graphic by Doug Whaley.)

for viewing only. The two exhibits have the same programs; however, one is lower in height to be easily accessible to small children and visitors in wheelchairs.

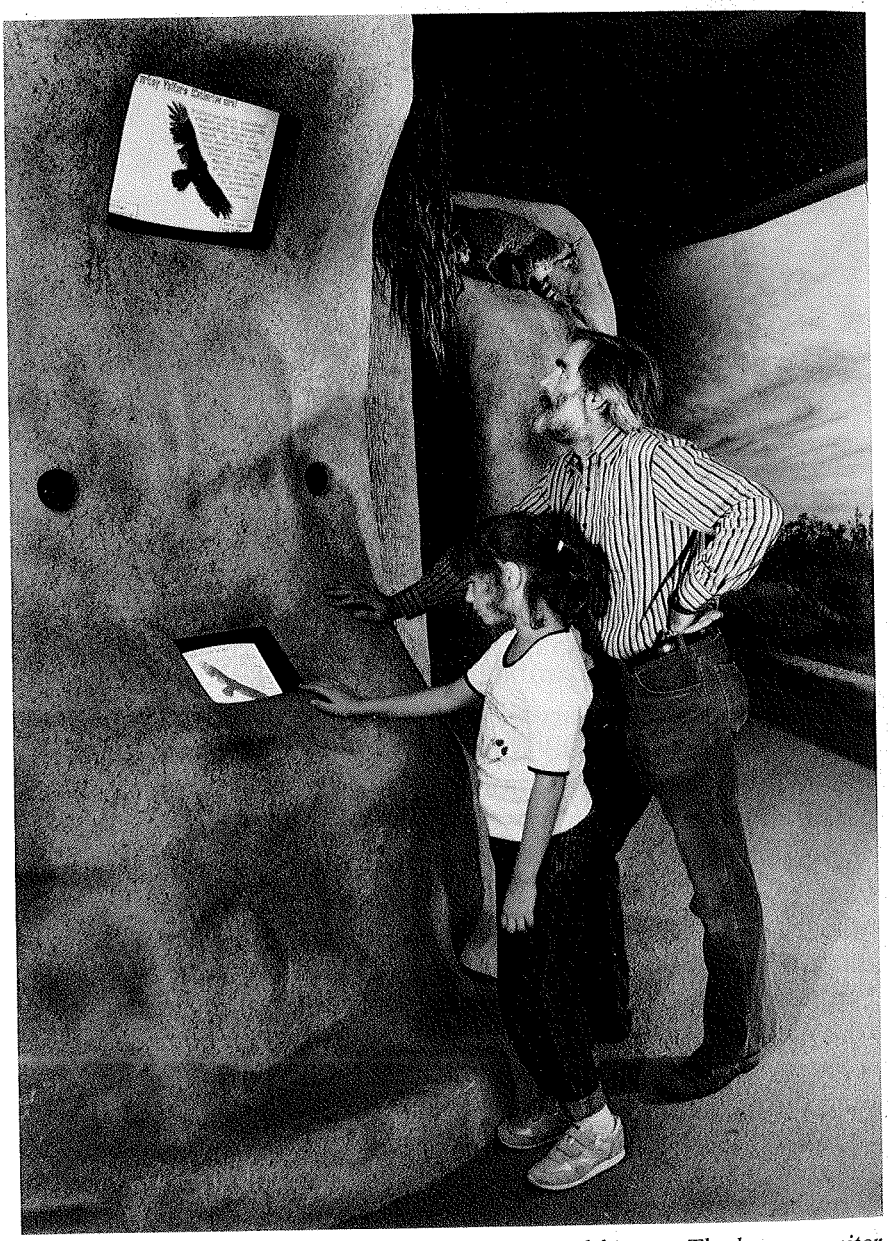
There are three primary ways of exploring the images, sound, and text. These are referred to as the "Picture Show," the "Menus," and the "Species Network." Visitors can choose one of these methods of exploration, or they can move from one to another at any time.

Picture Show—Visitors to the exhibit initially see changing pictures of desert organisms displayed on the screen. They have the option of requesting more information or related images for any of them. Control buttons on the screen allow the visitor to back up and review a previous image, see more pictures of the same species, or move into another mode. If no request is made after three seconds, the program displays a new picture. When no one is using the exhibit, it automatically goes into this mode.

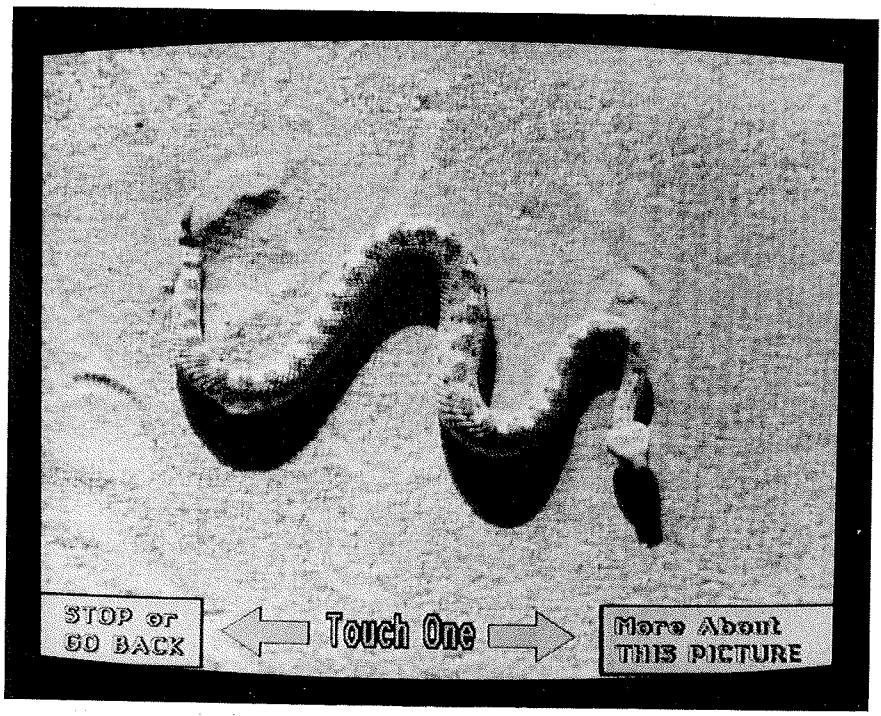
Two additional features of Picture Show attract and assist visitors when they enter the hall. At intervals of three minutes, the program plays the sound of a desert animal, one that normally vocalizes frequently during the day. In addition, when no one has used the exhibit for three minutes or more, the changing pictures run with a continuous graphic that invites visitors to touch the screen.

Menus—In this mode, the visitor is first asked to choose among

seven categories: Mammals, Birds, Reptiles, Arthropods, Plants, Animal Sounds, or back to the Picture Show. Touching any of the categories except Picture Show produces a menu that lists a selection



Visitors view a turkey vulture with text on its natural history. The lower monitor has an infrared touch screen to enable the visitor to control the exhibit, while a friend views the same image on the upper monitor. The step below the lower monitor enables even young children to use the exhibit. Speakers on either side produce the vocalization of the animal shown. (Photograph by Bill Evarts.)

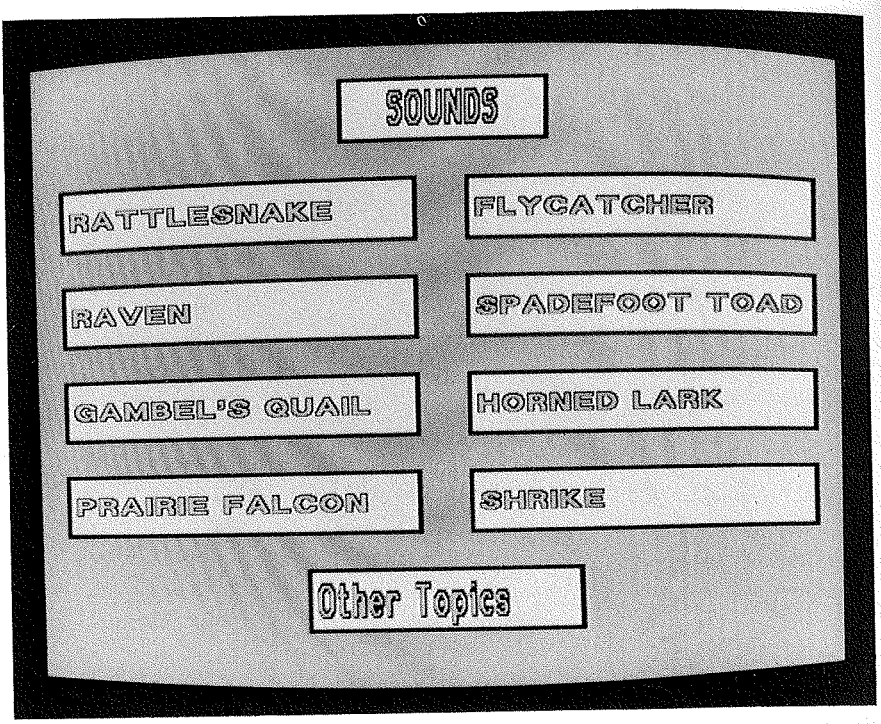


The Picture Show displays randomly assigned pictures of desert organisms and gives visitors the option of investigating any animal in more detail. (Photograph by Bill Evarts.)

of common names of animals from that category. The animal-sounds menu displays a selection of animals for which sound tracks are available. Touching the name of an organism in any menu initiates a series of pictures and text about that species. As in the previous mode, control buttons displayed on the screen allow visitors to step through the series of pictures of that species at their own pace, as well as to return to and review a previous image. The buttons also allow the visitor to move to another menu or to change to another method of exploring.

Species Network—There is a third method of exploring the exhibit. In the series of pictures of a given organism, an image of an ecologically-related species is inserted. The accompanying text indicates the ecological nature of the relationship. At this point in the program, visitors have the option of branching to the related species or continuing on with the original one. This option allows visitors to network from one organism to another, following a kind of ecological web.

These three different methods of access give people a great deal of control over the operation of the exhibit. Visitors can have

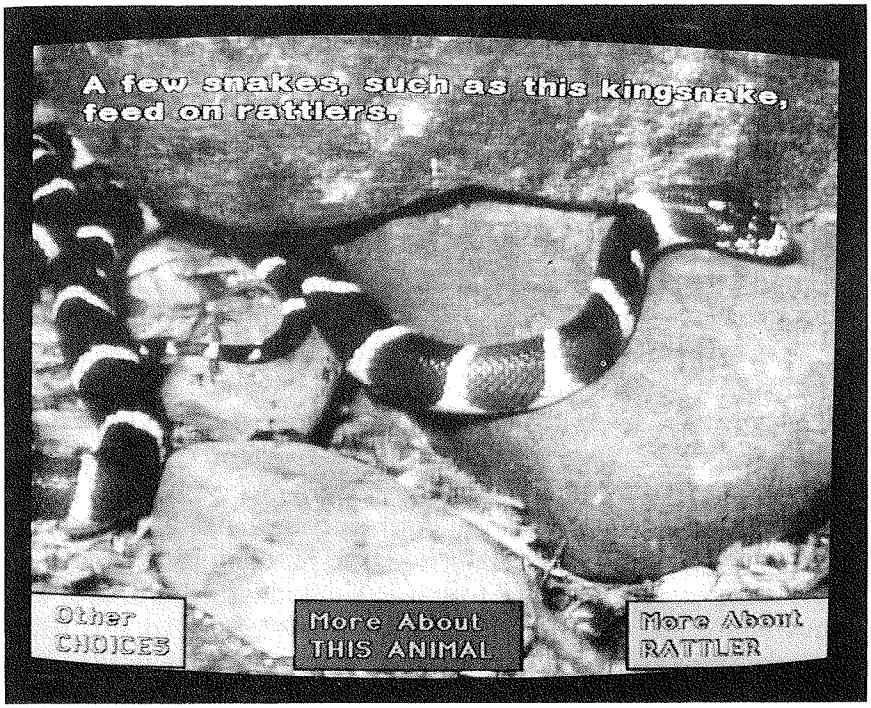


Menus are the second option for exploring the exhibit. When visitors touch the name of an animal listed here, the exhibit displays a picture of it, presents information on its natural history, and plays the common vocalizations made by it. The user can investigate the species further by calling for additional photographs, text, and sounds, or move on to other species. (Photograph by Bill Evarts.)

pictures presented to them, or they can step sequentially through the images of their choice. They can choose pictures on the basis of what kind of organism they are, or they can view them in random order. They can move "laterally" through the pictures and take in a little bit about many different organisms, or they can move "vertically," seeing many images from one species or group of organisms. Finally, they can network between ecologically-related species.

DESIGNING DESERT EXPLORATIONS

Utilizing a Commercially-Available Disk—Videodiscs are an optimal medium for displaying images in museum exhibits, but the cost of producing an original disk can be very high. When a computer is combined with a videodisc player, an exhibit can be made interactive, allowing visitors to explore visual information on the videodisc actively rather than viewing it passively. The computer can also be used to reorder and reformat images on a preexisting disk.



In Species Network, visitors follow a kind of ecological web. In a series of pictures of a rattlesnake, an image of an ecologically-related species, the kingsnake, is inserted. The kingsnake is a predator of the rattlesnake. Visitors have the option of branching to view photographs and information on the predator or continuing on with the rattlesnake. (Photograph by Bill Evarts.)

One can take a commercially available videodisc and overlay the images with new graphics, sound and text; select which images are relevant; locate the controls; and create any kind of interface appropriate to the hall where the exhibit is located. This offers an important alternative to developing a new disk, since it is far less expensive, and only the computer program that controls access to the disk must be developed (Allen, 1986).

Criteria for Selecting Elements of a Videodisc Exhibit—Several guidelines should be considered when using a computer with a commercially available videodisc.

- *The disk.* It should contain a sufficient number of images that relate to other exhibits in the hall. We chose the BioSci disk, produced by Videodiscovery, Inc.; of its 6,000 images, 325 frames showed desert organisms appropriate for our hall. The number of appropriate images varies greatly with the different archival disks available for a particular topic. We have chosen the Earth Science

disk produced by Optical Data Corporation for our mineralogy exhibit; it contains 50,000 images, of which we may use as many as a third.

- *Computer software.* Many kinds of computer software that control a videodisc are available. These are generally termed "authoring software." We looked for quality and flexibility in the graphics and text overlays, a wide choice of fonts, and the ability to digitize and edit sound because we would be adding our own recordings. We also looked for the capacity for high speed in generating screen images and making decisions. We chose Pilot Plus for the Desert Hall videodisc, but other high-quality authoring programs, such as Supercard, are rapidly becoming available.
- *Hardware.* Durability and speed are important criteria for the choice of computer and videodisc player. We wanted as fast a response time as possible from both machines. All the equipment had to be of industrial strength, designed for continuous use. Each authoring program is tied to particular kinds of hardware, and thus, since we used Pilot Plus, it was necessary to use IBM-compatible equipment. Each of our systems included an IBM PC/AT computer, 13- and 19-inch Sony monitors, Sony model 2000 videodisc player, Carroll-Touch touch screen, interface boards, and graphics and audio editing utilities.
- *Interface design.* The interface should be designed to be easily understandable without additional instructions. The labels on the designated touch-sensitive areas of the screen ("control buttons") have to be unambiguous, and buttons with similar functions should be consistently located. To attract people, we chose to have ongoing motion and sound when the exhibit was not in use.
- *Construction design.* The Desert Explorations videodisc exhibits are integrated into the overall design of the Hall of Desert Ecology. They are built into the "rock archway" structures of the hall. Each unit is actually on a cart located in a closet behind the wall, and they are easily serviced by pulling the cart out of the closet.
- *Location and position.* Many criteria were used to decide on the location and position of the videodisc exhibits inside the hall. Each exhibit has two monitors. One is reachable by visitors of all ages for touch control, the other is located higher up to be clearly visible to people standing nearby. We wanted one of the screens to be visible from outside the hall because we felt that it would encourage people to enter. We wanted the exhibit to be accessible to the wheelchair-disabled, young children, adults, and family and school groups. To achieve this, we made the lower monitors on the exhibits of different heights: one is for easy wheelchair access

and small children; the other is a comfortable height for adults with a step for children.

- *Costs.* The total cost of producing the first videodisc exhibit, including all hardware, software, and consultant labor for design, research, writing, programming, and installation was $33,000. The second (duplicate) exhibit, which required purchase of hardware and installation but no development, cost $12,000.

EVALUATION OF THE EXHIBIT PROTOTYPES

Evaluation of Desert Explorations included two phases: (1) evaluation of the exhibit prototypes to improve the exhibit as we developed it and (2) the evaluation of the completed exhibit to give us information we could use in subsequent projects.

During its development, preliminary versions of Desert Explorations were tested and revised many times on the basis of feedback from a wide range of users. Such prototype testing was facilitated by the ease with which the program could be modified. We were able to make small changes, test them, make further revisions, and then test again.

Our prototypes were reviewed by staff from nearly every department in the museum, education technologists from San Diego State University, and visitors who tried out the exhibit and gave their comments. We watched to see whether visitors could figure out how to use the exhibit immediately upon approaching it, and we continued to make modifications until our test subjects were successful. We observed how different subjects tried to explore the images, and we documented the range of their exploratory patterns. Later we observed how easily our subjects moved from one method of exploration to another.

Our first investigations showed us that visitors have quite distinct preferences for how they like to explore the exhibit, and this reinforced our initial idea to provide options. For example, when given a choice of several exploratory modes, one seven-year-old girl immediately went to the menu showing the list of mammals. She systematically investigated each mammal on the list, examining every picture available for each species. In contrast, several other subjects completely avoided using menus, even when we demonstrated how to use them. They preferred to explore images from Picture Show, investigating multiple pictures of each species of interest. They indicated their dislike for moving down an ordered list, and they strongly preferred having random images displayed for them.

Our observations also helped us decide on the height and position of the exhibit. For example, we observed one subject use the exhibit with his two young sons, one of whom had quite short arms. We were able to see how well the two boys activated the touch controls on the screen while sitting on their father's lap. The text for the exhibit was initially written for an eighth-grade reading level, checked for accuracy by museum scientists, and further modified on the basis of feedback from our test subjects.

EVALUATION OF THE COMPLETED EXHIBIT

After the exhibit was completed, additional observations and interviews were conducted in the Desert Hall during four two-hour periods at peak times (12:00 noon to 2:00 p.m.) on two successive weekends. Every visitor who entered the Desert Hall during this period (a total of 608) was categorized as to whether he or she used, watched, or effectively ignored the videodisc exhibit. Observations were made of the behavior of 50 other visitors to determine how they distributed their time among all the exhibits in the hall, and 34 visitors were observed in great detail while using the Desert Explorations exhibit. Finally, 20 groups of visitors were interviewed as they exited the hall.

Use of Desert Explorations—Approximately one-third of the people entering the hall used one of the two exhibits. Another third watched others using the exhibits, and the remaining third passed by without looking at the exhibit for more than three seconds. At times, two or three people used the touch screen together. Groups of onlookers were occasionally large; up to 15 people were observed watching a single upper monitor while others controlled the touch screen.

Visitors were attracted to the exhibit when Picture Show was running, when sounds were produced, and when the exhibit was being used by someone else. Visitors who used the touch screen stayed with the exhibit for an average of 4.4 minutes, a relatively long period of time for a museum exhibit. The duration of use sometimes seemed to be limited only by the patience of parents and other family members; the maximum time observed was 22 minutes.

The average user explored pictures of just over five different desert species. (The highest number of species examined was 24.) Although the mean number of pictures available for any one species was 3.4, users examined, on the average, only 1.7 pictures per species. Apparently, visitors generally preferred breadth over depth,

covering several different species but spending relatively little time on any one species.

Patterns of Exploration—Observations of a randomly selected group of 34 visitors indicated in detail how they used the various options for exploring. We recorded the entire sequence of pictures, menus, and control buttons used by these visitors while interacting with the exhibit.

About one-quarter of the subjects made use of Picture Show as their primary means of exploration. This was determined from the relative numbers of species examined, the number of menu choices, and the number of requests to restart the show. Even though they were clearly aware of the existence of the menus, they preferred to make their initial selections on the basis of the pictures rather than the names of the organisms. Possibly these individuals were less interested in particular groups of organisms than in sampling broadly from the contents of the exhibit.

The remaining three-quarters of the subjects used Menus more extensively than Picture Show, apparently preferring to exercise more control over which images were presented. They first selected among the seven categories and then chose which particular species to investigate. Most visitors did not explore the menus systematically, examining each option in turn. They instead selected an average of two general categories and explored only about two of the eight species on each menu. The largest number of menus that anyone selected was four. The menu of desert animal sounds was strongly favored over any of the taxonomic menus.

The option of moving along Species Networks was less commonly used than either Menus or Picture Show. One-quarter of the visitors made some use of this facility, however. Use of Species Network was largely a function of depth of exploration: visitors who viewed more pictures of each species were more likely to network than visitors who viewed only one or two images.

SUMMARY AND DISCUSSION

Museum visitors are bombarded with bits of new information in the form of facts, images, actions, and even emotions. How visitors explore and ultimately organize this information tells us much about how people learn in such settings. Visitors are, however, a heterogeneous group. They do not all explore exhibits in the same way. Previous research in museums has shown, for example, that adults and children differ in their readiness to approach and manipulate

objects (Hilke and Balling, 1985; Diamond, 1986; Koran et al., 1986; Diamond et al., 1988). In both adults and children, females and males have been shown to differ in their patterns of exploration and use of interactive exhibits (Cone and Kendall, 1978; Diamond, 1986).

This article describes the development of an exhibit that takes advantage of new technologies to give visitors choices in how they explore visual images. On the basis of our evaluation of this exhibit, we found that our visitors fell into two distinct groups. About three-quarters used Menus extensively, preferring more complete control over the selection of pictures and the hierarchical organization of topics. The remaining one-quarter preferred Picture Show, in which they let the exhibit randomly select pictures from which they could sample. These two groups of visitors appear to represent fundamentally different strategies for accessing and organizing information in a museum. Visitors may, in fact, be as diverse in how they process information in a museum as in how they behave in other respects.

Interactive exhibits can be an effective means for conveying scientific concepts in a museum (Feher and Rice, 1985). Exhibits using visually-based media, however, are likely to be more effective teaching tools when they offer freedom for exploration. New technologies give us the tools to make exhibits more flexible than ever before, but this is useful only in the context of how visitors actually behave. The design and use of new technologies in museums must reflect what we know about how our visitors explore, reason, and play. The Desert Explorations exhibit gives an example of how to use new technologies to serve the diverse nature of the museum audience, putting how to learn and what to learn in the hands of visitors.

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